Chapter 1

Purpose and Need for Action

Chapter 1

Purpose of and Need for Action

1.1 INTRODUCTION

This Supplemental Environmental Impact Statement (SEIS) has been prepared to update site-specific information and evaluate reclamation alternatives for the GSM open pit after mining is completed. This document supplements the 1998 Final Environmental Impact Statement (EIS) prepared for a proposed expansion of mining operations at the Golden Sunlight Mine (GSM) (DEQ and BLM, 1998a). Reclamation alternatives for the GSM pit were evaluated in a Draft EIS issued in 1997 (DEQ and BLM, 1997) and the 1998 Final EIS; however, some important conditions have changed since that time, resulting in an agency decision to prepare this SEIS.

As required by the National Environmental Policy Act (NEPA) and the Montana Environmental Policy Act (MEPA), this SEIS identifies the Proposed Action, defines and evaluates alternatives to that action, and identifies potential environmental impacts of the Proposed Action and alternatives. The Proposed Action evaluated in this document is a pit backfill proposal modified by the agencies' comments and GSM's responses to those comments (See GSM, December 2002; DEQ/BLM, January 14, 2003; GSM, April 23, 2003; DEQ/BLM, June 16, 2003; GSM, August 8, 2003; DEQ/BLM, August 27, 2003; GSM, September 17, 2003; DEQ/BLM, November 18, 2003; GSM, December 19, 2003) including the revised acreages submitted as part of GSM's 2004 Annual Report (GSM, 2005). The Proposed Action involves partially backfilling the pit when mining operations cease at GSM. In this document, the Proposed Action is referred to as the "Partial Pit Backfill With In-Pit Collection" Alternative.

What has changed in Chapter 1 since the DSEIS?

Chapter 1 explains the purpose of the SEIS and the need for the Proposed Action. Based on additional data and public comments, the following changes have been made:

- The GSM 2004, 2005, and 2006 Annual Reports were used to update all figures.
- Figure 1-3 was added to show land ownership.
- Certain references used in the Final SEIS were added to Table 1-2. Both those and other references were also added to the reference section in Chapter 7.
- For other issues that BLM must consider and mitigate to, references to sections in the SEIS were noted.
- All text, figures and tables were revised from data provided by GSM and various consultants.
- Text was corrected based on references.

MEPA and NEPA policies are intended to ensure that governmental agencies make informed and deliberate decisions, while expanding the public right to participate in those decisions. Agencies are required to carry out these policies through the use of a systematic, interdisciplinary analysis on actions that affect the human environment. DEQ and BLM determined that, under MEPA and NEPA regulations and in accordance with the procedures set forth in the Metal Mine Reclamation Act (MMRA), it was necessary for the agencies to conduct an analysis to thoroughly investigate potential environmental impacts of a modified proposal to partially backfill the GSM open pit (GSM, 2002). The revised pit reclamation plan was submitted by GSM on December 2, 2002, as ordered by DEQ on October 24, 2002. This SEIS represents that required additional systematic analysis. The purpose of this SEIS is to evaluate the potential environmental impacts associated with the Proposed Action and alternative pit reclamation plans at the mine.

This SEIS follows the Council on Environmental Quality's (CEQ) recommended document organization (40 Code of Federal Regulations (CFR) 1502.10). Chapter 1 presents the purpose and need for the Proposed Action. Chapter 2 describes and compares the Proposed Action and alternatives, and identifies the agencies' Preferred Alternative. Chapter 3 describes the affected environment. Chapter 4 presents the environmental consequences associated with the Proposed Action and alternatives, including direct, indirect, and cumulative impacts, and describes agency mitigations to reduce or minimize impacts. Chapter 5 presents information on consultation and coordination. Chapter 6 presents the names of those who submitted public comment during the scoping period. Chapter 7 contains the list of preparers, references and glossary. Copies of supporting documents are on file in the administrative record in the Montana Department of Environmental Quality (DEQ) office in Helena, and at the U.S. Department of the Interior, Bureau of Land Management (BLM) Field Office in Butte, Montana.

1.2 PURPOSE OF AND NEED FOR ACTION

The purpose of and need for action is to provide for effective, legally compliant, environmentally sound and safe mine pit reclamation at the Golden Sunlight Mine, considering changes in condition that have occurred since the Final EIS was issued in 1998 and additional information developed through research and evaluation completed since 1998. Action is needed due to the continued operations at GSM (conducted under the approved operating permit (as amended)), changes in the MMRA, and requirements imposed by the District Court decision (all described in more detail in Section 1.4.3, Background and History).

In the years since the FEIS was completed, the pit design has changed, underground mining has been approved, and large portions of the waste rock dump complexes have been reclaimed. These differences are due to mining operations that have taken place, which are in accordance with GSM's approved operating permit and agency-approved minor revisions to that permit. Also, additional research and evaluation have provided more information pertaining to the geology, hydrology and geochemistry of the mine area.

State standards for final reclamation have been amended by the legislature.

1.3 OBJECTIVES

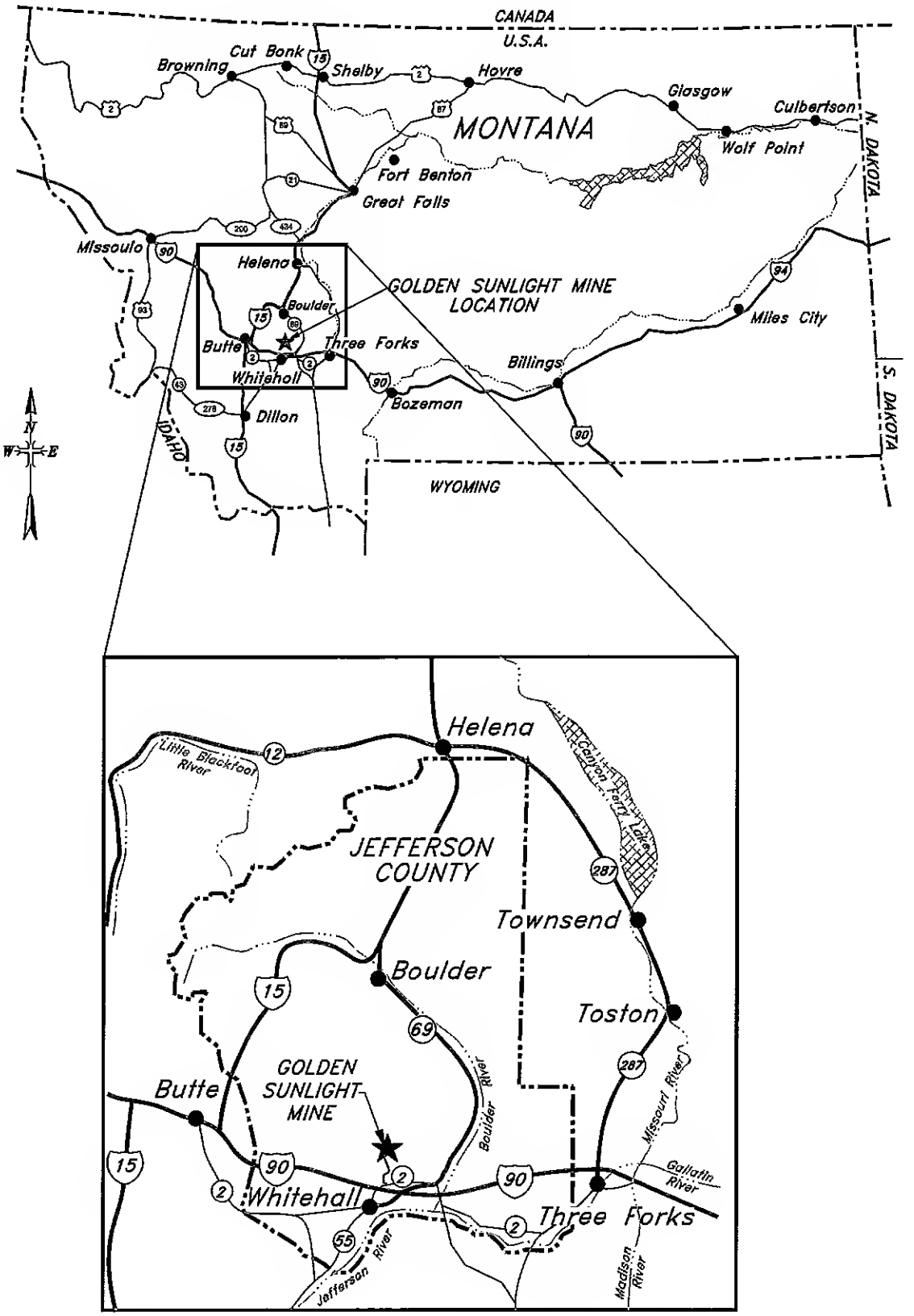
The objectives of the analyses included in this SEIS are as follows:

- Comply with the June 2002 judgment of the Montana First Judicial District Court (District Court) to implement the partial pit backfill reclamation plan at GSM in accordance with the procedures set forth in MMRA;
- Evaluate the partial pit backfill plan and reasonable alternatives as required by MEPA and NEPA;
- Evaluate the partial pit backfill plan and alternatives and develop a pit reclamation plan that will comply with existing federal, state, and local laws, including the 2003 amendments to MMRA;
- Provide the public with an opportunity to comment on the SEIS for reclamation of the pit as required by MEPA and NEPA;
- Provide the regulatory agencies' decision makers with the best available scientific information on which to base their decision as required by MEPA and NEPA;
- Minimize adverse impacts to existing, approved reclamation plans for the rest of the mine site and long-term water treatment plans; and
- Protect long-term water quality.

1.4 PROJECT LOCATION AND RELEVANT HISTORY

1.4.1 Project Location

GSM is located approximately 5 miles northeast of Whitehall, Montana (Figure 1-1). Access to the site is via State Highway 2 East, located adjacent to Interstate 90. Existing mining operations are located in: Sections 19, 20, 28, 29, 30, 32, and 33 of Township 2 North, Range 3 West; Section 6 in Township 1 North, Range 3 West; and Sections 24 and 25 in Township 2 North, Range 4 West in Jefferson County, Montana.



GENERAL LOCATION MAP

FIGURE 1-1

Figure 1-1 GenLoc BW.dwg

1.4.2 Mineral and Surface Ownership

Golden Sunlight Mines, Inc. is the owner and operator of the existing and proposed operations. The corporate address is: Golden Sunlight Mines, Inc., 453 Montana Highway 2 East, Whitehall, Montana, 59759.

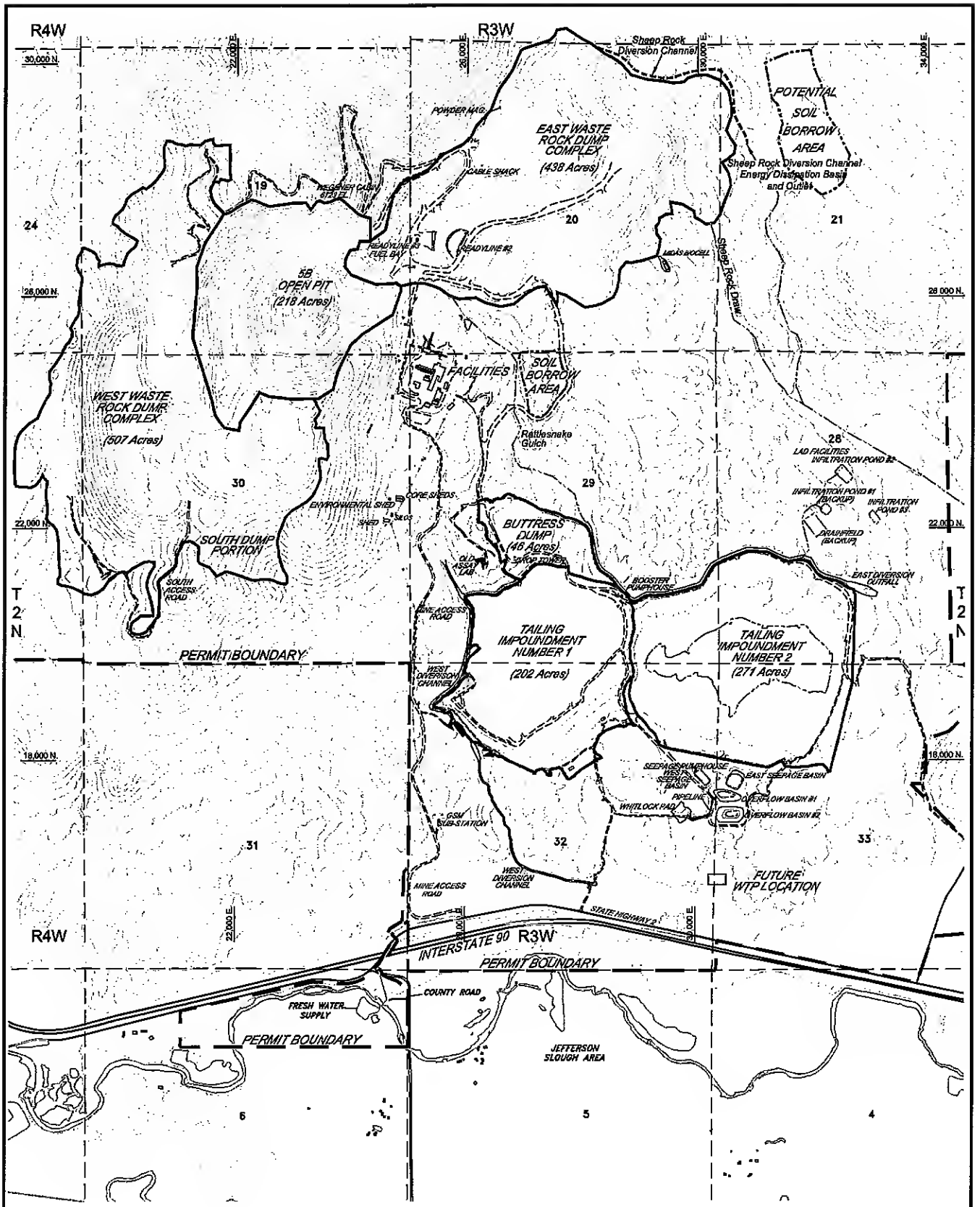
GSM is a subsidiary of Barrick Gold U.S. Inc., 136 East South Temple, Suite 1300, Salt Lake City, Utah 84111. Barrick Gold U.S. Inc. is an indirect, wholly-owned subsidiary of Barrick Gold Corporation, a public company, whose address is BCE Place, Canada Trust Tower, 161 Bay Street, Suite 3700, P.O. Box 212, Toronto, Canada M5J 2S1. Barrick Gold Corporation stock is traded on the New York Stock Exchange and other exchanges around the world.

GSM mines and processes gold-bearing ore using facilities located on private lands (both fee simple and patented mining claims) controlled by GSM, on unpatented mining claims located on federal lands administered by BLM, and on Montana state school trust land under mineral lease by GSM. The mine facilities are shown on Figure 1-2. The land ownership is shown on Figure 1-3.

1.4.3 Background and History

GSM is a conventional truck and shovel open pit mine. Approximately 1/6 of the excavated material is ore and 5/6 is waste rock. The ore is milled using a vat cyanide leach process at the mine site, while the waste rock is placed in large dump complexes. Following processing, the mill slurry goes to the tailings impoundment where tailings settle out and the water is pumped back and reused in the process circuit.

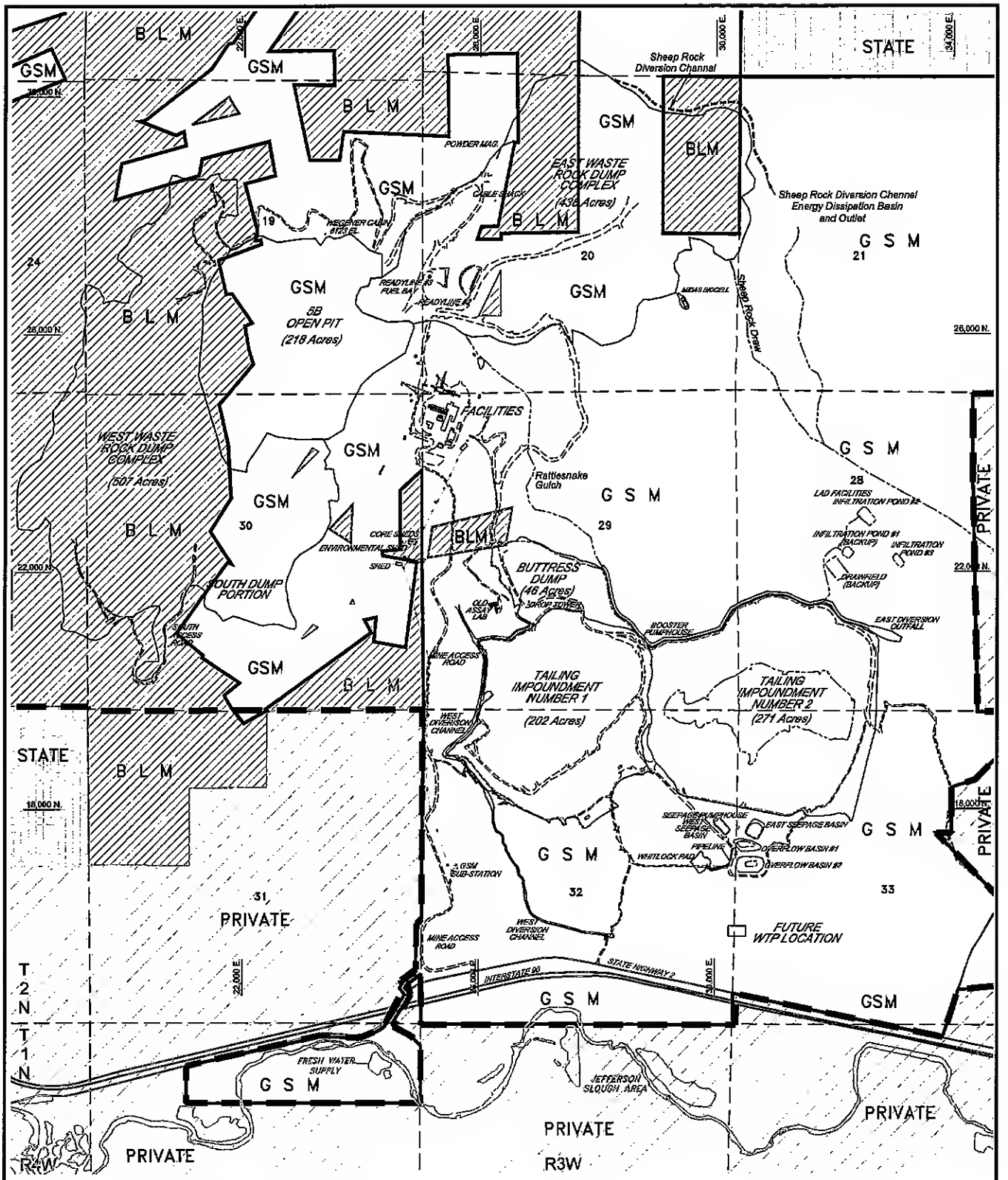
The GSM pit extends below the natural water table. The workings are kept dry by pumping out groundwater and surface water that enter the pit. Two bedrock wells are installed within the perimeter of the pit to intercept groundwater and assist in dewatering. At GSM, the collected water, which is naturally slightly acidic and increases in acidity by contact with sulfide rock in the pit, is pumped to an on-site treatment facility where the acidity is neutralized and metals are removed before the water is used in the milling process or discharged.



MINE FACILITIES AS OF DECEMBER 2006

Figure 1-2 Facilities.dwg

FIGURE 1-2



LAND OWNERSHIP

Figure 1-3 Ownership.dwg Rev. 1/2006

FIGURE 1-3

The vast majority of waste rock at GSM has potential to create "acid rock drainage" (ARD), because it contains sulfides that can easily generate acids upon exposure to air and water. The ARD potential has been characterized by testing conducted during the mine's lifetime (GSM 1982 to 2006 Annual Reports; Dollhopf, 1989; and as listed in Appendix OP-6 in GSM, 2004a). ARD has a low pH and contains concentrations of heavy metals (e.g., copper, cadmium, and nickel) above water quality standards. Reclamation of waste rock to reduce ARD is an important issue. Closure plans detail the reclamation, water treatment, and monitoring activities to which GSM is committed after operations cease (GSM, 1995b and 2004). GSM has approved reclamation and closure plans in place. GSM's reclamation bond is $63,355,020 with the stipulation that the bond would be incrementally increased over the life of the mine based on the amount of new disturbance each year. GSM has posted a total bond of $54,380,000 to cover reclamation, water treatment, and closure costs. GSM is currently bonded for 2,619.55 acres of disturbance. Through December 31, 2006, GSM has disturbed 2,236 acres and reclaimed 1,072 acres (2006 GSM Annual Report).

GSM conducts mining and mineral processing activities under DEQ Operating Permit No. 00065 and BLM Plan of Operations #MTM82855. The Montana Department of State Lands (DSL, now DEQ) issued GSM's Operating Permit on June 27, 1975. BLM issued GSM's Plan of Operations in 1982. An amendment for a major expansion was authorized in April 1981 after an EIS was written (DSL, 1981). The amendment authorized a new operating plan, including construction of mill support facilities, Tailings Impoundment No. 1, and Pit Stages 1, 2, and 3. The next seven permit amendments addressed relatively minor modifications to GSM's operations.

From 1985 through 1987, additional ore reserves were identified that would extend the mine life to at least the year 2003. In March 1988, GSM applied for an amendment to increase the size of the pit by adding two more mine stages (Pit Stages 4 and 5), and construct a second tailings impoundment (GSM, 1995a). Amendment 008 was authorized on July 1, 1990, following preparation of an Environmental Assessment (EA) (DEQ and BLM, 1990). As a result of the amendment, GSM's reclamation bond was increased from $1,750,000 to $23,915,000.

In 1992, five environmental groups (National Wildlife Federation, Montana Environmental Information Center, Mineral Policy Center, Gallatin Wildlife Association, and Sierra Club) brought legal action against the State of Montana and GSM. The plaintiff groups alleged that GSM's reclamation plan was insufficient and violated MMRA and the Montana Constitution, and that an EIS should have been prepared rather than an EA. On September 1, 1994, the District Court ruled that the statutory exemption of open pits from reclamation requirements was unconstitutional and that an EIS should have been prepared. A judgment was entered in 1995 whereby GSM would submit a revised reclamation plan and DEQ would prepare an EIS with BLM acting as co-lead.

In 1995, the Montana Legislature amended MMRA to provide standards for reclamation of open pits. In part, the amendment required reclamation to specified conditions "to the

extent feasible". The enacting legislation contained a Statement of Intent that listed the factors that the Legislature intended DEQ to consider in determining feasibility.

At that time, GSM decided to seek another permit amendment. The amendment would enable GSM to replace the previously planned waste rock dump area, lost due to ground movement in 1994, by expanding its existing waste rock dump complexes in the northeast and west sides of the operating permit area. The amendment also would allow GSM to expand the pit, extend the mine life, modify its reclamation plans, and extend the operating permit boundary.

GSM submitted the amendment application in July 1995 (GSM, 1995b). The EIS process began in October 1995. DEQ and BLM authorized an Interim Mine Plan so that GSM could continue mining and waste rock disposal during preparation of the EIS. Amendment 009 was issued in April 1997 for placement of waste rock at an expanded Interim Mine Plan Dump location. For the next three years, GSM operated under the Interim Mine Plan.

The Draft EIS was completed in November 1997 (DEQ and BLM, 1997b). The Final EIS was completed in April 1998 (DEQ and BLM, 1998a), and the Record of Decision (ROD) was signed in June of 1998 (DEQ and BLM, 1998b). DEQ and BLM authorized Amendment 010, which extended the life of active mining through Stage 5B, on July 9, 1998.

In the 1998 ROD, DEQ and BLM applied the factors set out in the Legislature's Statement of Intent and selected the No Pit Pond Alternative for reclamation of the pit. In its February 16, 2000, Memorandum and Order Decision, the District Court found that DEQ erred by using the factors in the Statement of Intent and by not choosing the Partial Backfill Alternative. The District Court also found, "Today, the record before the Court reveals that the major environmental and reclamation concerns at Golden Sunlight Mine, specifically, the open pit and the highwall, are best capable of being reclaimed by means of the partial pit backfill alternative. In addition, the record shows that partial pit backfill reclamation will provide comparable utility and stability with other disturbed lands. Furthermore, partially backfilling the pit can significantly reduce acid mine drainage."

In 2000, the Legislature again amended the open pit reclamation provisions of MMRA. Shortly thereafter, DEQ reexamined its previous decision imposing the No Pit Pond Alternative, determining that it met the requirements of the 2000 legislative amendment. The plaintiffs again challenged DEQ's decision.

The District Court held in March 2002 that the 2000 amendments to MMRA were unconstitutional because they did not comply with the Montana constitutional mandate that "all lands disturbed by the taking of natural resources shall be reclaimed." In its ruling, the District Court quoted the language listed above. The District Court then stated "that record has not changed." The District Court subsequently ordered DEQ to

immediately begin implementation of the partial pit backfill reclamation plan at GSM in accordance with the procedures set forth in MMRA.

In 2003, the Montana Legislature again amended the law pertaining to the reclamation of open pits and made the amendment applicable to the GSM operation. Subsection 82-4-336(9) now provides that:

> "(c) The use of backfilling as a reclamation measure is neither required nor prohibited in all cases. A department decision to require any backfill measure must be based on whether and to what extent the backfilling is appropriate under the site-specific circumstances and conditions in order to achieve the standards described in subsection (9)(b)."

Subsection 82-4-336(9)(b) provides that the highwall and pit must be reclaimed to a condition:

> (i) of stability structurally competent to withstand geologic and climatic conditions without significant failure that would be a threat to public safety and the environment;
> (ii) that affords some utility to humans or the environment;
> (iii) that mitigates post-reclamation visual contrasts between reclamation lands and adjacent lands; and,
> (iv) that mitigates or prevents undesirable offsite environmental impacts.

Under the Partial Backfill Alternative evaluated in the 1998 Final EIS and not selected in the 1998 ROD, the backfill material for the pit would have come from both the East and the West Waste Rock Dump complexes. Virtually all of the West Waste Rock Dump Complex is located on land owned by the U. S. and managed by BLM. The location of waste dumps on BLM managed federal lands are shown on Figure 1-3. Portions of the pit and the East Waste Rock Dump Complex are also BLM-managed federal lands. On September 6, 2002, BLM notified DEQ that the Partial Backfill Alternative may result in "unnecessary or undue degradation of public lands", and that, before GSM can be required to reclaim under the Partial Backfill Alternative on federal land, BLM must prepare a supplemental review pursuant to NEPA and approve the modification to the reclamation plan. DEQ agrees with BLM that a limited analysis of the potential environmental effects from groundwater exiting the backfilled pit from the Partial Backfill Alternative was completed in the 1997 DEIS.

On October 24, 2002, DEQ, acting pursuant to the June 27, 2002, District Court judgment, ordered GSM to submit a modified partial pit backfill plan to meet the requirements of MMRA, its implementing rules, and the judgment of the District Court. The plan was to take into consideration current conditions at the mine site and address compliance with the Montana Water Quality Act. GSM submitted a proposed partial pit backfill plan on December 2, 2002 (GSM, 2002).

The proposed partial pit backfill plan addresses the following site conditions at the mine that have changed since the 1998 ROD was issued:

- GSM has implemented a modified pit design resulting in a different pit configuration than was used in the 1998 evaluations;
- The original Partial Backfill Alternative, which was evaluated in 1997, called for a large portion of fill material to be obtained from the West Waste Rock Dump Complex. That waste rock dump has since been reclaimed;
- GSM has mined underground under the pit, which could affect backfill operations;
- Additional technical information and evaluation was required to assess the waste rock backfill effects on compliance with the Montana Water Quality Act; and
- GSM has received numerous permit revisions to allow minor modifications to GSM's operations. These revisions cover a variety of activities such as road building, well construction, research projects, and water disposal.

In order to meet the requirements of the October 24, 2002 Order, GSM submitted a Partial Pit Backfill With In-Pit Collection Plan. This is analyzed as the Proposed Action in this SEIS (see Section 1.5). This SEIS is tiered to the 1997 Draft EIS and the 1998 Final EIS.

1.4.4 Current Approved Plan

The 1998 ROD approved the No Pit Pond Alternative as modified by the Return Diversion Alternative (Map II-2, 1997 Draft EIS). The ROD contains various stipulations that were applied to the permit in order to implement the amendment.

As approved in 1998, the pit would be mined to the 4,700-foot elevation. Minor revision 03-001 to deepen the pit to the 4,650-foot elevation was approved by the agencies in 2003 (DEQ and BLM, 2003). The pit design would essentially remain as it is currently permitted (Figure 2-1). Mining operations would continue at least until 2007.

After mining operations cease, GSM would have to implement its closure plan (GSM, 1995b, 2004). The current approved reclamation plan for the pit would involve placing about 475,000 cubic yards (713,000 tons) of waste rock back into the pit to bring the pit bottom to the 4,800-foot elevation (1998 ROD, Stipulation 010-8; Figure II-3, 1997 Draft EIS; DEQ bond calculation, 1998). In addition, 26 acres of pit roads and benches that could be accessed would be covered with soil and revegetated. The remainder of the pit would be left open and not be backfilled.

A waste rock sump in the backfill would collect all water that enters the pit. Water collected in the sump would be pumped from two dewatering wells to the permanent water treatment plant as needed, treated and discharged (Figure 1-2). The dewatering system would maintain the groundwater level as low as possible in the backfill,

preventing the formation of a pit pond and maintaining the pit as a hydrologic sink. According to the 1997 Draft EIS Chapter IV, Section IV.B.6.b, approximately 102 gpm would need to be pumped out regularly to keep the water level as low as possible.

The above-described pit reclamation plan was approved in 1998 by the regulatory agencies. This decision has been legally challenged, as explained in Section 1.4.3.

1.5 PROPOSED ACTION

As ordered by DEQ, GSM provided the details of a modified Partial Pit Backfill With In-Pit Collection Plan, which is the Proposed Action in this SEIS (GSM, 2002). The Proposed Action includes reclaiming the pit by partially backfilling it to the level at which surface water would freely drain from the pit ("daylight level") on the east side of the pit and covering the highwall (Figure 2-4). The current operating permit allows mining through Stage 5B, which was estimated in the 1998 Final EIS to last through 2006. Groundwater and surface water that would naturally flow into the pit would be collected, pumped, and treated at the water treatment facility (Figure 1-2). See Chapter 2 for details of this alternative.

The major differences from the Partial Backfill Alternative (Figure II-4, 1997 Draft EIS) evaluated in the 1997 Draft EIS are:

- Based on the current approved mine designs, the pit configuration has been modified, including the bottom elevation and the elevation of the eastern key cut, the low point on the pit rim where the haul road enters the pit. The elevation of the key cut is 5,350 feet, and, therefore, the pit would have to be backfilled to this level to allow surface water to drain away from the pit area after reclamation. The final pit depth would be the 4,525-foot elevation as proposed or at least the 4,650-foot elevation approved by DEQ in minor revision 03-001, which affects the quantity of backfill material required;
- No waste rock material would be removed from the West Waste Rock Dump Complex;
- Cast blasting and dozing would be used to reduce the upper pit highwall rather than hauling all backfill material from the West Waste Rock Dump Complex;
- Before backfilling the pit to the key cut, 100 feet of crusher reject would be placed in the pit to the 4,625-foot elevation to aid in collecting water for pumping; and,
- A 3-foot soil cover system approved for the waste rock dump complexes is proposed for the cover on the backfill material.

1.6 REGULATORY AUTHORITY RULES AND RESPONSIBILITIES

1.6.1 Applicable Regulatory Requirements

1.6.1.1 Introduction

Table 1-1 lists the permits, licenses, and reviews that are required at GSM. The air quality permit would not require modification because the mining and milling rates would not change. Consultation with the Montana State Historic Preservation Office (SHPO) regarding cultural resources was conducted by BLM. GSM's updated Storm Water Pollution Prevention Plan has been approved by DEQ.

Table 1 - 1. Mine Permits, Licenses, and Reviews

Granting Agency	Permit/Approval
BLM, Butte Field Office	Administering Federal Land Policy and Management Act and NEPA to prevent unnecessary or undue degradation.
U.S. Fish & Wildlife Service (USFWS)	Review under the Endangered Species Act.
Environmental Protection Agency (EPA)	SEIS review under the Clean Air Act.
U.S. Army Corps of Engineers	Permit under Section 404 of the Clean Water Act.
DEQ	Administering MMRA and MEPA; requiring bonding for reclamation of disturbed lands and water treatment; ensuring compliance with state water, air, and hazardous waste regulations; and issuing water discharge and air quality permits.
Montana State Historic Preservation Office (SHPO)	Review under the National Historic Preservation Act and 36 CFR 800 regarding protection of cultural/historic resources.
Jefferson County Disaster & Emergency Relief Coordinator	Review of Floodplain and Emergency Operations Plans regarding uncontrolled releases of hazardous substances.
Jefferson County Weed District	Review for control and prevention of noxious weed infestations.

1.6.1.2 Montana Department of Environmental Quality

DEQ administers MEPA, MMRA, the Montana Hazardous Waste Act, the Clean Air Act of Montana, and the Montana Water Quality Act. DEQ is responsible for investigating

the environmental impacts associated with pit reclamation at GSM in accordance with MEPA and the EIS process, and for evaluating compliance with MMRA.

1.6.1.3 U.S. Bureau of Land Management

BLM manages federally owned lands under its jurisdiction and federally owned minerals. GSM's use of public land must conform to BLM's surface management regulations (43 CFR, Subpart 3809) to prevent unnecessary or undue degradation as well as various federal statutes, including NEPA, the Mining and Mineral Policy Act of 1970, the General Mining Laws, and the Federal Land Policy and Management Act of 1976. BLM must review plans for development on BLM-administered land. The Proposed Action was evaluated for conformance with BLM's Headwaters Resource Management Plan (RMP) Butte and Lewistown Districts (BLM, 1984). Livestock grazing, wildlife habitat, recreation, and mineral resource development are land uses identified in the RMP as appropriate for the project area.

In addition to the requirements of MEPA, the NEPA process was followed during the preparation of the SEIS to ensure:

- Adequate provisions are included to prevent unnecessary or undue degradation of public lands and to protect the non-mineral resources on public lands.
- Measures are included to provide for reclamation of disturbed areas.
- BLM's NEPA Handbook (H-1790, Appendix 5) requires that all EISs address certain Critical Elements of the Human Environment. Any elements that do not occur within the GSM permit area and would not be affected are indicated in Issues Considered but Not Studied in Detail (Section 1.7.3), and those elements are not discussed further in the SEIS.

This elimination of non-significant issues follows the CEQ guidelines as stated in 40 CFR 1500.4. Conformance with the Headwaters Resource Area RMP is ensured and compliance with applicable substantive state and federal laws is achieved through following the CEQ guidelines. BLM is responsible for Section 106 consultation with SHPO in regard to the following on BLM lands:

- The eligibility of cultural resources located on BLM lands within and near the permit area; and,
- The effect of approval of the Proposed Action on eligible cultural resources.

Critical elements of the human environment that BLM must consider and mitigate impacts to, if necessary, include:

- Areas of critical environmental concern (Section 1.7.3.10);
- Prime or unique farm lands (Section 1.7.3.11);
- Floodplains (Section 1.7.3.12);

- Native American religious concerns (Section 1.7.3.9);
- Threatened or endangered species (Section 1.7.3.3);
- Solid or hazardous wastes (Section 1.7.3.6);
- Drinking water/groundwater quality (Section 1.7.2.2.1.1);
- Wetlands/riparian zones (Section 1.7.3.1);
- Wild and scenic rivers (Section 1.7.3.13);
- Wilderness (Section 1.7.3.14);
- Environmental Justice (Section 1.7.3.15); and,
- Invasive, non-native species (Section 1.7.3.16).

All of the issues listed above were considered, although some were not considered in detail as described in this document.

1.6.1.4 Participating Agencies

The lead agency for preparation of the SEIS is DEQ, with BLM acting as co-lead. BLM consulted with USFWS, pursuant to the Endangered Species Act, and SHPO, pursuant to the National Historic Preservation Act, during the preparation of this SEIS.

EPA will review this SEIS pursuant to the federal Clean Air Act, and also participated in the Multiple Accounts Analysis (MAA) process (Robertson GeoConsultants, 2003).

1.6.2 Decisions to Be Made

The DEQ Director and the BLM Field Manager will use the SEIS to decide which pit reclamation alternative to implement and what mitigation measures, if any, to add to the selected alternative.

1.6.3 Relationship to Other Environmental Planning Documents

Numerous documents were reviewed in the development of the Draft and Final SEIS, some of which are not listed in Chapter 7. The MEPA/NEPA and other documents pertinent to GSM that influenced the Draft and Final SEIS are listed in Table 1-2.

Table 1 - 2. Related Environmental and Planning Documents

Document Title	Author	Date
Operating Permit No. 00065	DSL	April 24, 1975
Cultural Resource Class III Inventory Report Number 80-MT-070-075-11,12	Miller, B., BLM	August 6, 7, 1980
Environmental Impact Statement for Amendment 001	DSL	April 1981
Section 32 Tailing Disposal Facility, Golden Sunlight Project, Vol. I. Report Submitted to Golden Sunlight Mine	Sergent, Hauskins & Beckwith, Geotechnical Engineers	September 14, 1981
Cultural Class III Inventory Report Number 82-MT-070-075-14	Taylor, J., BLM	1982
Cultural Class III Inventory Report Number 83-MT-070-075-01, 09	Taylor, J., BLM	1982, 1983
Golden Sunlight Mines, Inc. Annual Reports	GSM	1990-2004
Hydrogeologic Evaluation, Tailing Disposal Facility, Golden Sunlight Project, Whitehall, Montana	Sergent, Hauskins & Beckwith, Geotechnical Engineers	October 24, 1985
Cultural Class III Inventory Report Number 85-MT-070-075-25	Taylor, J., BLM	1985
Cultural Resource Investigation and Assessment of the Golden Sunlight Mine	Herbort, D., State of Montana Land Exchange	1985
Hydrogeologic Evaluation, Tailing Disposal Facility, Golden Sunlight Project, Whitehall, Montana	Sergent, Hauskins & Beckwith, Geotechnical Engineers	August 5, 1986
Hydrogeologic Evaluation, Golden Sunlight Project, Whitehall, Montana	Sergent, Hauskins & Beckwith, Geotechnical Engineers	April 23, 1987
Investigation of Golden Sunlight Mine's Tailings Pond Leak and Alleged Impact to Downgradient Domestic Water Supplies	DSL	May 15, 1987
Site Visit Report, Rock Waste Dump and Midas Slump	Seegmiller International Mining Geotechnical Consultants	1987, 1988

Document Title	Author	Date
Results of an Investigation of the High Nitrate Values in Wells Surrounding the Golden Sunlight Mine	DSL	1988
Final Design Development Report, East Tailing Disposal Facility, Golden Sunlight Mine Vol. II. Submitted to Golden Sunlight Mine	Sergent, Hauskins & Beckwith, Geotechnical Engineers	July 19, 1988
Soil Survey of the Golden Sunlight Mine Proposed Expansion Area	Ottersberg, B.	1988
Hydrogeologic Evaluation, Golden Sunlight Project, Whitehall, Montana	Sergent, Hauskins & Beckwith, Geotechnical Engineers	February 10, 1989
Hydrogeologic Evaluation to Support Environmental Assessment, Golden Sunlight Project, Whitehall, Montana	Sergent, Hauskins & Beckwith, Geotechnical Engineers	February 27, 1989
Assessment of Potential Acid Producing Characteristics of Geologic Material From the Golden Sunlight Mine	Dollhopf, D.	1989
Relationship of the Golden Sunlight Mine To the Great Falls Tectonic Zone	Foster, F. and Chadwick, T.	1990
Should Pits be Filled? Oregon Geology, Volume 52, No. 4, pp. 82-83	Throop, A.	1990
Assessment of Water Quality Impacts – Report to MDHES	Hydrometrics	1990
Cultural Resource Inventory for the Golden Sunlight Mine Expansion Area	Peterson, R.R., Western Cultural Resource Management, Inc	1991
Geology and General Overview of the Golden Sunlight Mine	Foster, F.	1991
Jefferson County Montana 1993 Comprehensive Plan	Jefferson County Planning Board	1993
Golden Sunlight Mines, Inc. Tailings Impoundment No. 1 Post-Closure Settlement.	Knight Piesold Ltd.	1993
A Fluid Inclusion, Stable Isotope, and Multi- Element Study of the Golden Sunlight Deposit. M.S. Thesis, Iowa State University	Paredes, M.M.	1994
Soil Baseline Study, Golden Sunlight Mine	Houlton, H.M. and Noel, R.D., Westech Technology and Engineering	1994-1995

Document Title	Author	Date
Class 1 Paleontologic Literature and Locality Search for the Golden Sunlight Mine Expansion Project	Lindsey, K.D., Western Cultural Resource Management	September 20, 1994
Report from F. Foster of GSM to S. Olsen of DSL and J. Owings of BLM, Regarding Ground Movement Remediation	Foster, F.	December 23, 1994
Class III Cultural Resource Inventory of Approximately 3,277 Acres for Golden Sunlight Mine	Peterson and Mehls	1994
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Document Title	Author	Date
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Interim Dump Plan (approved by DEQ and BLM in 1995 & 1997)	GSM	(two minor revisions in 1995 and 1997)
Cultural Resource Inventory of 340 Acres and Testing/ Evaluation of Eight Sites for Golden Sunlight Mine Land Exchange	Peterson, R.R., Western Cultural Resource Management, Inc	1996
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Report on Water Quality Trends in No. 1 Impoundment Area	Hydrometrics	1997
Review of Documents Concerning Research at Golden Sunlight Mine	Bennett, J.W.	1997
Draft Environmental Impact Statement Golden Sunlight Mine	DEQ and BLM	November 1997
Water Quality Regulatory Compliance and Application for Source Specific Groundwater Mixing Zone, Golden Sunlight Mines	GSM	January 1998
Final EIS Amending and Adopting the Draft Environmental Impact Statement for Golden Sunlight Mine	DEQ and BLM	April 1998
Record of Decision for the Proposed Mine Expansion Golden Sunlight Mine Permit Amendments 008 and 010 to Operating Permit 00065	DEQ and BLM	June 1998
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Golden Sunlight Mines, Inc. Operating and Reclamation Plan. A Summary of the Golden Sunlight Mine Operations	GSM	2001

Document Title	Author	Date
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Pit Hydrogeology Investigation	URS Corp.	December 4, 2001
Preliminary Report of Environmental Risks of Proposed Backfilling of Golden Sunlight Pit	Hydrologic Consultants, Inc. (prepared for GSM)	November 26, 2002
Golden Sunlight Mines, Inc. Partial Pit Backfill Plan as Ordered by Montana Dept. of Environmental Quality on October 24, 2002	GSM	December 2, 2002
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DEQ Internal Memo – Comments with respect to water quality– Golden Sunlight Mines, Inc. Partial Pit Backfill Plan As Ordered by DEQ on Oct. 24, 2002	George Furniss, DEQ	December 30, 2002
DEQ/BLM Deficiency Review of GSM Partial Pit Backfill Plan	DEQ and BLM	January 14, 2003
Environmental Data Compilation for the Open Pit Area and Potential Pit Backfill Material	Kathy Gallagher	March 21, 2003
Response to DEQ/BLM Deficiency Review of GSM Partial Pit Backfill Plan	GSM	April 23, 2003
Pit Highwall Seeps	Kathy Gallagher	May 28, 2003
Preliminary SAP Mineralogy Result Summary	Telesto	June 3, 2003
DEQ/BLM Second Deficiency Review of GSM Partial Pit Backfill Plan	DEQ/BLM	June 16, 2003
Memorandum on Stepan Spring Water Quality	Kathy Gallagher	June 30, 2003
Response to DEQ/BLM Second Deficiency Review of GSM Partial Pit Backfill Plan	GSM	August 8, 2003
DEQ/BLM Third Deficiency Review of GSM Partial Pit Backfill Plan	DEQ/BLM	August 27, 2003
Response to DEQ/BLM Third Deficiency Review of GSM Partial Pit Backfill Plan	GSM	September 17, 2003

Document Title	Author	Date
Amendments to Operating Permit 00065, particularly Amendment 008	GSM	Various dates
Geotechnical Report for the Reclamation Alternatives for the Golden Sunlight Mine Pit Technical Memo	Telesto	September 2003
Water Balance Model Technical Memo	Telesto	October 2003
Hydrologic Conceptual Model Technical Memo	Telesto	October 2003
Pit Backfill Geochemistry Technical Memo	Telesto	October 2003
Feasibility Assessment Technical Memo	Telesto	October 2003
GSM SEIS Hydrology Support Document	HydroSolutions	October 2003
Pit Analog Study	Kathy Gallagher and Laura Kuzel	October 2003
History of Failures at the GSM Pit	Telesto	November 2003
DEQ/BLM Fourth Deficiency Review of GSM Partial Pit Backfill Plan	DEQ/BLM	November 18, 2003
Response to DEQ/BLM Fourth Deficiency Review of GSM Partial Pit Backfill Plan	GSM	December 19, 2003
DEQ/BLM Current Permit and Bond Status for Operating Permit 00065	DEQ/BLM	January 20, 2004
DEQ/BLM Completeness Letter of GSM Partial Pit Backfill Plan	DEQ/BLM	February 17, 2004
Bio Fouling Potential in Backfill Wells	Telesto	February 20, 2004
Golden Sunlight Mines, Inc. 2003 Annual Permit Report	GSM	June 2004
Review of Draft Supplement Environmental Impact Statement	Brawner Eng.	February 2005
Golden Sunlight Mines, Inc. 2004 Operating and Reclamation Plan	GSM	March 2005
Post-Closure Pit Slope Stability Mineral Hill Pit	Golder Associates	April 2005
Proposed Management Options for Golden Sunlight Mine Pit	Engineering Management Support	April 8, 2005
Visual Resource Evaluation Technical Memorandum	Telesto	April 11, 2005

Document Title	Author	Date
Mineralogical Analysis and Hydraulic Conductivity Measurements Technical Memorandum	Telesto	June 16, 2005
Summary of Geotechnical, Hydrological, and Geochemical options, Partial Pit Backfill	Telesto	2005
Data Report on Geologic Structure West Wall Mineral Hill Pit	Golder Associates	August 1, 2005
Water Balance Model Update Technical Memorandum	Telesto	March 9, 2006
Hydrology Support Document Update Golden Sunlight Mine Pit Reclamation Final SEIS	HydroSolutions	May 12, 2006
Golden Sunlight Mines, Inc. 2005 Annual Permit Report	GSM	July 2006
Golden Sunlight Mines, Inc. 2006 Annual Permit Report	GSM	June 2007
Jefferson River Alluvial Aquifer and Jefferson River Slough Mixing Evaluation For the Golden Sunlight Mine FSEIS	HydroSolutions	July 10, 2007

1.7 PUBLIC PARTICIPATION PROCESS

1.7.1 Scoping

The scoping process is used to identify all issues relevant to the Proposed Action and to help develop alternatives to the Proposed Action. Efforts were made during preparation of this SEIS to involve members of the public and other agencies to define the issues and the scope of analyses.

A Notice of Intent (NOI) to prepare the SEIS was published in the Federal Register on May 7, 2003. The NOI invited scoping comments to be sent to DEQ and BLM through June 7, 2003. On July 1, 2003, a press release was issued to area newspapers, State of Montana Newslinks Service, and major interest groups. A public scoping meeting was held near the mine in Whitehall, Montana, on July 16, 2003. Approximately 165 members of the public attended the meeting and public comments were recorded. As a result of the public scoping process, 75 comment letters were received by DEQ and BLM. Issues and concerns raised at the meeting and contained in the written comments were summarized for consideration in preparation of the SEIS. DEQ and BLM also attended a public informational meeting sponsored by the Whitehall Community Transition Advisory Committee in Whitehall on September 9, 2003, to update local residents on SEIS progress.

1.7.2 Multiple Accounts Analysis Process and Issues Studied in Detail

In an effort to systematize issue evaluation and alternative development and to involve the various agencies and stakeholder groups, DEQ and BLM decided to use the Multiple Accounts Analysis (MAA) process (Robertson GeoConsultants, 2003). The MAA process was developed for evaluation of land management alternatives as a means of comparing alternatives by weighing benefits and costs. It is particularly useful when projects are controversial, because it allows for multi-stakeholder/multi-disciplinary teams to attempt reaching consensus by having opponents and proponents of the project work together. It also aids the consideration of possible reclamation measures, evaluation of the effectiveness of the reclamation alternatives, and revision of the alternatives to optimize their effectiveness.

During the MAA process, representatives from each of the agencies and stakeholder groups participated in a technical working group (TWG) to produce and evaluate alternatives. In this case, the TWG consisted of two representatives each from BLM, DEQ, GSM and its technical consultants, EPA, and, collectively, the five plaintiffs in the District Court action. Spectrum Engineering and its subcontractor, Robertson GeoConsultants, directed the TWG and the MAA process. The TWG met on May 16, June 18 to 19, July 2, and August 4 to 5, 2003. In addition to these meetings, two subgroups met to address the primary concerns including hydrology and geochemistry. Although the MAA was not formally completed, it did provide valuable input on alternatives and environmental impacts.

A local rancher attended the fourth MAA meeting and provided input from a public stakeholder viewpoint to the process.

An evaluation was performed to distinguish potentially significant issues from non-significant issues. Potentially significant issues are evaluated in detail in Chapter 4 of this environmental review, and rationale is presented in Section 1.7.3 for issues that were initially considered but then eliminated from detailed study. All issues identified through public input or identified through analysis are presented and summarized individually. While discussion of all identified issues is necessary for full disclosure of impacts under MEPA and NEPA, the issues do not necessarily correspond with, or are co-extensive to, the agencies' selection criteria under applicable federal and state law.

A number of concerns associated with the 1997 Draft EIS Partial Backfill Alternative that, prior to this SEIS, had not been raised or for which new information has become available have been identified. The issues studied in detail are presented in Table 1-3. Issues identified in Section 1.7.3 are not studied in detail in this SEIS because the issues have not changed since the 1998 Final EIS and no new data are available.

Table 1 - 3. Issues Studied In Detail

ISSUE GROUP	ISSUE	INDICATOR
Technical	Design & constructibility of the alternative	Proven design (done successfully at other places?)
Technical	Design & constructibility of the alternative	Ability to construct the alternative at GSM
Technical	Pit highwall	Pit highwall stability
Technical	Pit highwall	Pit highwall maintenance requirements
Technical	Backfill	Backfill maintenance requirements
Technical	Underground workings	Impacts to pit facilities due to subsidence related to underground mining
Technical	Groundwater/effluent management system	Operation requirements (number of wells)
Technical	Groundwater/effluent management system	Maintenance of capture points
Technical	Storm water runon/runoff Management	Maintenance requirements (drainage channels off 2H:1V slopes)
Technical	Soil Cover	Soil cover maintenance requirements (erosion, revegetation)
Technical	Water treatment	Additional sludge management requirements
Technical	Water treatment	Additional operating requirements
Technical	Flexibility for future Improvements	Potential for utilization of new technologies
Environmental	Impacts to groundwater quality and quantity	Risk of impacts to groundwater quality and quantity in permit area
Environmental	Impacts to groundwater quality and quantity	Risk of violation of groundwater standards at permit boundary and impacts to beneficial uses of the Jefferson River alluvial aquifer
Environmental	Impacts to surface water quality and quantity	Impacts to springs, wetlands
Environmental	Impacts to surface water quality and quantity	Risk of violation of surface water standards and impacts to beneficial uses of the Jefferson River and Slough
Environmental	Reclamation plan changes	Surface disturbance
Environmental	Reclamation plan changes	Hazards to wildlife
Environmental	Reclamation plan changes	Total remaining unrevegetated acres
Socioeconomic	Safety	Risk to workers (reclamation and construction)
Socioeconomic	Safety	Risk to workers (long-term maintenance)
Socioeconomic	Safety	Risk to public safety
Socioeconomic	Mining employment	Potential employment from mining Stage 5B
Socioeconomic	Reclamation employment	Reclamation employment opportunities
Socioeconomic	Revenue from taxes	Potential tax revenues from mining Stage 5B
Socioeconomic	Revenue from taxes	Potential tax revenues from pit backfill
Socioeconomic	Mineral reserves and	Access to future mineral reserves/resources

	Resources	
Socioeconomic	Land use after mining	Suitability of land use after mining
Socioeconomic	Potential future burden	Potential future burden on society
Socioeconomic	Aesthetics	Visual contrast with adjacent lands
Socioeconomic	Potential future burden	Potential for future liabilities for GSM
Project Economics	Costs	Reclamation costs

Only those resources described as being affected in Chapter 3 or related to significant issues described in Chapter 1 are studied in detail in Chapter 4.

1.7.2.1 Technical Issues

1.7.2.1.1 Design and Constructibility of the Alternative

1.7.2.1.1.1 Proven Design

In engineering projects, the design and constructibility of the components are fundamental to the success of the project. Whether the components of the alternatives are considered proven within the mining and reclamation industries must be considered.

1.7.2.1.1.2 Ability to Construct the Alternative at GSM

Whether the components of the alternatives can be constructed as designed at GSM must be determined and risks and uncertainties evaluated.

1.7.2.1.2 Pit Highwall

1.7.2.1.2.1 Pit Highwall Stability

The highwall of a pit is designed to remain sufficiently stable to permit the extraction of minerals during operations with the minimum amount of waste rock removal. As such, a highwall typically is not designed to remain completely stable for an indefinite period of time after closure. Over the long term, natural processes, such as chemical and physical weathering and/or localized seepage, could change rock characteristics in the pit highwall causing periodic raveling and sloughing as the highwall gradually evolves to a more stable configuration over time.

The potential for larger geologic failures, such as slide failures or wedge failures especially from earthquakes, which might cause large and sudden movements of material in the pit highwall, also exists in open pits and must be analyzed.

If backfill materials are introduced into the pit, highwalls that are covered across the pit from highwall to highwall will be more stable than pits that are not backfilled. After construction and as the backfill itself weathers and gradually becomes saturated, some settlement of the backfill could occur. Portions of the highwall not covered on the 2

horizontal:1 vertical (2H:1V) slopes could still weather at a slower rate behind backfill materials.

1.7.2.1.2.2 Pit Highwall Maintenance Requirements

As discussed in the previous section, the pit highwall in alternatives that do not require backfill will continue to ravel over time. The amount of maintenance required to operate and maintain a pit dewatering system, access to the pit, reclamation covers, and storm water systems must be addressed because of pit highwall stability concerns.

1.7.2.1.3 Backfill

1.7.2.1.3.1 Backfill Maintenance Requirements

As discussed in Pit Highwall Stability, there are stability concerns with the backfill itself over time. The amount of maintenance required to operate and maintain a pit dewatering system depends on the amount of backfill, settling, weathering, chemical composition of the waste rock, and degree of saturation.

1.7.2.1.4 Underground Workings

1.7.2.1.4.1 Impacts to Pit Facilities Due to Subsidence Related to Underground Mining

Subsidence of underground workings over time may cause impacts to dewatering system function, worker safety, and future access to the pit and underground workings.

1.7.2.1.5 Groundwater/Effluent Management System

1.7.2.1.5.1 Operation Requirements (Number of Wells)

The potential risk of contamination to groundwater is more important than to surface water at GSM. The risk to the overall groundwater system is affected by many factors.

The disturbances in the mineralized zone caused by mining and related activities at GSM have exposed a large volume of sulfides to the atmosphere, thereby accelerating the natural weathering processes and releasing more metals and sulfur (as sulfate) into water. This ARD, or acid rock drainage, is the largest environmental concern, or potential impact, as a result of mineral extraction at GSM.

Nearly all of the materials that have been mined at GSM are highly reactive, oxidize quickly and produce acid. Seepage from these materials will be acidic with high concentrations of dissolved sulfate and elevated levels of a variety of dissolved metals. Because the open pit mine extends deep into the groundwater system, water quality problems occurring inside the pit backfilled with ARD generating material could impact downgradient groundwater and adjoining aquifers.

Plans for the prevention or control of groundwater degradation must be evaluated with respect to short- and long-term utility and effectiveness. Due to potential impacts to groundwater and a limited potential impact to surface water resources, confidence that the controls chosen will work when implemented and continue to work far into the future is required.

Conceptually, capturing or treating contaminated water before it flows from the pit would eliminate the concern over flow paths from the pit and would limit the amount of water requiring treatment. If the alternative selected depends on wells for dewatering, the number of wells required and their depths will influence the manageability and dependability of the system as well as cost. As increasing amounts of backfill are placed inside the pit, operational limitations of managing wells in the acidic waste rock backfill could occur. Operating dewatering systems in hundreds of feet of backfill complicates water collection in backfilled pits. Operation of wells in acidic backfill or native materials around the pit needs to be addressed in various alternatives.

Alternatives that rely on capturing and treating impacted groundwater in order to protect the surrounding water resources will either need to control the water level in the pit or have the capacity to intercept a high percentage of the water escaping the pit. Backfilling the pit could complicate the collection system and make groundwater collection less certain. Issues related to pit dewatering include installing and maintaining dewatering systems safely in the acidic waters.

Safety issues differ between open pits and backfilled pits. Safety for workers is an issue in open pits.

Settling and compaction effects on dewatering systems were not evaluated previously in the 1997 Draft EIS. Issues related to flowpath control in a backfilled pit have been identified with and without in-pit dewatering systems:

- The backfill in the pit may not be completely free draining and could include zones of relatively low permeability;
- The non-homogeneous nature of the backfill could make it difficult to reduce water levels evenly and maintain a hydrologic sink; and,
- The presence of backfill could make it difficult to fully determine the flow paths of groundwater and the chemical reactions that are occurring.

1.7.2.1.5.2 Maintenance of Capture Points

Some problems with maintenance of capture points in the backfilled pit are discussed above. Attempting to manage a collection system located at the bottom of an open pit or in the existing underground workings accessed through the pit could also present long-term management and safety problems. There is a chance of deterioration of the pit highwall and subsidence of the underground workings over time. Although practices

would be used to minimize hazards to workers and damage to equipment, maintaining access could be problematic.

Relying on capture of pit outflows at distances downgradient of the pit may introduce a larger degree of uncertainty and risk concerning the effectiveness of capturing all contaminated groundwaters and could require collection of a greater volume of groundwater. Maintenance of capture points needs to be addressed in all alternatives.

If capture systems cannot be maintained, contaminated groundwater could reach the Jefferson River alluvial aquifer.

1.7.2.1.6 Storm Water Runon/Runoff Management

1.7.2.1.6.1 Maintenance Requirements

The maintenance requirements for the storm water drainage channels off the reclaimed 2H:1V slopes caused by settling of the backfill must be evaluated.

1.7.2.1.7 Soil Cover

1.7.2.1.7.1 Soil Cover Maintenance Requirements

Reclamation of over 1,072 acres of disturbed land has been completed since the 1998 Final EIS (GSM 2006 Annual Report). This reclamation has resulted in a shortfall of stockpiled soil for reclamation activities. Although an adequate volume of soil exists for reclamation activities under the No Pit Pond Alternative in the 1997 Draft EIS, Chapter IV, Section IV.C.6.a, backfilling the pit would result in additional soil requirements. Additional disturbance would be needed to obtain adequate soil under the modified backfill plans. Maintenance of the reclamation cover, erosion, and revegetation must be addressed for all alternatives.

1.7.2.1.8 Water Treatment

1.7.2.1.8.1 Additional Sludge Management Requirements

In the 1997 Draft EIS, Appendix C, the sludge from the water treatment plant would be deposited in cells in Tailings Impoundment No. 2 and reclaimed. The amount of additional sludge from treating pit water for each alternative must be evaluated.

1.7.2.1.8.2 Additional Operating Requirements

The dewatering systems needed for each alternative will affect the operating requirements of the water treatment plant and must be evaluated.

1.7.2.1.9 Flexibility for Future Improvements

1.7.2.1.9.1 Potential for Utilization of New Technologies

Flexibility for implementing improved water collection and treatment systems in the future must be evaluated. The potential for future improvements and utilization of new technologies must be considered for each alternative.

1.7.2.2 Environmental Issues

1.7.2.2.1 Impacts to Groundwater Quality and Quantity

1.7.2.2.1.1 Risk of Impacts to Groundwater Quality and Quantity in Permit Area

Groundwater flow direction has been mapped through previous studies using monitoring wells of various depths. Approximately 30 wells in the pit area are monitored quarterly. Groundwater flows into the pit from underneath and from all sides, with the steepest gradient on the north side. Understanding this flow system will be critical to the identification of potential impacts of reclamation alternatives.

Over time, the waste rock that is placed in the pit could be chemically and physically altered, causing pore waters with elevated concentrations of naturally occurring contaminants. The changing physical properties of the materials may affect flow patterns and the changing chemistry of the effluent has the potential to impact downgradient groundwater. The ability to capture groundwater in various pit reclamation alternatives will affect the potential for additional impacts to groundwater in the permit area.

1.7.2.2.1.2 Risk of Violation of Groundwater Standards at Permit Boundary and Impacts to Beneficial Uses of the Jefferson River Alluvial Aquifer

If additional groundwater is impacted in the permit area from the open pit, then the potential to violate water quality standards at the permit boundary and impact beneficial uses in the Jefferson River alluvial aquifer must be evaluated.

1.7.2.2.2 Impacts to Surface Water Quality and Quantity

1.7.2.2.2.1 Impacts to Springs, Wetlands

Control of poor quality water both in and out of the pit is needed in order to prevent impacts to adjoining aquifers and possibly downgradient surface water.

One of the risks that has been identified is the potential development of seeps in areas outside of a backfilled pit. Natural ARD seeps, likely controlled by fractures in the

mineralized bedrock, occur at the mine site. After mining, if the groundwater table rebounds to a static condition, fracture controlled flow to surface seeps could increase or develop again. Those reclamation alternatives that include backfill and/or do not maintain the pit as a hydrologic sink are likely to have a greater potential for seep development or for increased flow or metal loading at existing seeps, than those that do not include backfill. On the other hand, those alternatives that maintain the pit as a hydrologic sink could minimize the risk of seep development, but would lead to flow reductions in local springs.

Although drainages within the mine boundary are ephemeral and there are no perennial streams within the mine boundary, surface water contamination from mine operations is potentially an issue at GSM. There are historic springs and seeps within the GSM permit area that could be impacted by mine or reclamation operations. Several of these springs or seeps (Bunkhouse, Rattlesnake, Stepan, and Stepan Original springs) produce acid drainage, much of which is from regional naturally mineralized areas and may not be impacted by GSM. Many seeps discharge from the pit highwall. The quantity and quality of water from the seeps varies seasonally. If pit water cannot be captured, it could influence surface water quality and quantity in the historic seeps and the small wetlands associated with them and/or at new discharge points.

1.7.2.2.2.2 Risk of Violation of Surface Water Standards and Impacts to Beneficial Uses of the Jefferson River and Slough

The 1997 Draft EIS, Section IV.B addressed impacts to seeps and springs that might be dewatered if the open pit is maintained as a hydrologic sink. The SEIS must analyze impacts to seeps and springs in backfill alternatives that may or may not allow the water table to rebound and discharge from the pit. The SEIS must analyze impacts to seeps and springs from all alternatives. The potential impacts of flow from the backfilled pit to the Jefferson River/Slough must also be analyzed.

1.7.2.2.3 Reclamation Plan Changes

1.7.2.2.3.1 Surface Disturbance

Cast blasting the upper highwall occurring under partial pit backfill alternatives would result in additional disturbance. Some waste rock and soil would have to be hauled to areas around the pit where access has been cut off. In order to access the top of the northwest highwall of the pit with equipment, additional acreage would be disturbed to construct haul roads and other features.

1.7.2.2.3.2 Hazards to Wildlife

Potential hazards to wildlife that need to be addressed include birds landing in or ingesting poor quality water or acid salts in the pit, wildlife using water impacted by pit seepage, and wildlife falling off the highwall or pit benches.

1.7.2.2.3.3 Total Remaining Unrevegetated Acres

Impacts to vegetation caused by additional surface disturbance in each alternative as well as the amount of land left unrevegetated must also be evaluated.

1.7.2.3 Socioeconomic Issues

1.7.2.3.1 Safety

1.7.2.3.1.1 Risk to Workers (Reclamation and Construction)

Pit haul roads are steep and there are safety issues associated with operating haul trucks down pit haul roads to implement any backfill alternative. GSM currently does not have a written policy regarding fully loaded haul trucks traveling down haul roads into the pit. Waste rock would have to be dumped from the top or trucks would only be partially loaded, resulting in a longer and more expensive project. The engineering and safety issues associated with the alternatives will be evaluated. Policies would be developed to ensure the safety of workers involved in haulage activities and other pit personnel.

1.7.2.3.1.2 Risk to Workers (Long-Term Maintenance)

Safety and security of personnel and equipment that are required to be in the pit for maintenance of the dewatering system need to be addressed for alternatives that leave the pit open.

In some alternatives, the pit would be maintained in approximately the same configuration left by mining. In these cases, the pit has cliff-like configurations that could be hazardous. Stability of the highwall could deteriorate over time, producing raveling and sloughing. Some limited instability could also be associated with the backfill options, as sloughing could occur along the recontoured pit highwall as the result of chemical weathering, freeze-thaw disturbance, and the buildup of groundwater in localized areas.

1.7.2.3.1.3 Risk to Public Safety

Under all open pit options, access restrictions on general public use would need to be maintained.

1.7.2.3.2 Mining Employment

1.7.2.3.2.1 Potential Employment from Mining Stage 5B

The number of jobs impacted with or without mining Stage 5B needs to be analyzed for backfill alternatives. Some alternatives may preserve the potential for future mining and possibly provide employment associated with continued mineral exploration.

1.7.2.3.3 Reclamation Employment

1.7.2.3.3.1 Reclamation Employment Opportunities

A certain number of jobs with or without mining Stage 5B will be created or maintained during the reclamation construction period. The amount of employment will depend on the alternative chosen. In general, alternatives with higher backfill requirements will provide more short-term socioeconomic benefits inside the county. For alternatives requiring more long-term monitoring and management, a small number of jobs will be sustained indefinitely.

1.7.2.3.4 Revenue from Taxes

1.7.2.3.4.1 Potential Tax Revenues from Mining Stage 5B

As long as the mining company or a successor controls the property, the water treatment plant and other property will remain on the county tax base. Under some alternatives, continued revenue from taxes due to mining would be generated. Under a partial pit backfill alternative, there is a possibility that these taxes would not be accrued if Stage 5B did not proceed to completion.

1.7.2.3.4.2 Potential Tax Revenues from Pit Backfill

Regardless of whether Stage 5B is completed, backfilling will produce short-term jobs and revenues. The impacts of backfilling on revenues will be addressed in each alternative.

1.7.2.3.5 Mineral Reserves and Resources

1.7.2.3.5.1 Access to Future Mineral Reserves/Resources

GSM has indicated that precious metal mineralization extends beyond the planned limits of the open pit floor and highwall. GSM believes that if these resources are buried due to backfilling requirements, the cost of recovering minerals in the future may be so high that the resource is completely lost. Future access to minerals for each alternative needs to be evaluated.

1.7.2.3.6 Land Use After Mining

1.7.2.3.6.1 Suitability of Land Use After Mining

The potential for each reclamation alternative to achieve the land use after mining must be evaluated.

1.7.2.3.7 Aesthetics

1.7.2.3.7.1 Visual Contrast with Adjacent Lands

The alternatives in the SEIS are similar to those evaluated in the 1997 Draft EIS. The mitigation of visual contrast between reclaimed lands and adjacent undisturbed lands must be evaluated for each alternative.

1.7.2.3.8 Potential Future Burden

1.7.2.3.8.1 Potential Future Burden on Society

Closed mining operations with long-term management requirements represent a potential liability on society. Bonds are posted to address that risk. The future burden on society in each alternative must be evaluated.

1.7.2.3.8.2 Potential for Future Liabilities for GSM

For all alternatives, it is anticipated that pit water treatment would be required indefinitely. GSM has a water treatment plan and has posted bond with DEQ for long-term water treatment. Facilities used to collect, treat, release and monitor surface water and groundwater will need to be maintained, upgraded, rebuilt and/or replaced. Volumes of water needing treatment vary with each alternative.

Some alternatives may rely on mixing and partial attenuation of impacted water to produce a less degraded water chemistry. This could limit long-term management requirements, but may in turn increase risk and liability for the company.

Long-term water treatment represents the site management that the company will control. This represents a liability to the company. Alternatives that do not achieve complete control of pit water increase the liability for GSM or some other future party.

1.7.2.4 Project Economics Issues

1.7.2.4.1 Reclamation Costs

Some level of backfilling could eliminate any reasonable likelihood of realizing a positive return on investment for GSM. Reclamation costs must be evaluated as an impact to GSM.

1.7.3 Issues Considered but Not Studied in Detail

Issues not studied in detail and the rationale for their exclusion are discussed below.

1.7.3.1 Wetlands

Wetland issues were addressed in the 1997 Draft EIS, Chapter IV, Section IV.D. Approximately 56 to 58 more acres would be disturbed under the partial pit backfill alternatives to build haul roads and to cast blast the upper highwall. Thirty-one acres would be disturbed to salvage soil. No new wetlands would be disturbed in these acres.

1.7.3.2 Wildlife and Fisheries

Wildlife and fisheries issues associated with the permit area were evaluated in the 1997 Draft EIS, Chapter IV, Section IV.E. No new impacts to wildlife or fisheries have been identified in the 87 to 89 acres that would be disturbed under the partial pit backfill alternatives in addition to those disclosed in previous reviews. The potential for each reclamation alternative to achieve the wildlife habitat land use after mining is evaluated in the SEIS in Section 4.3, Environmental Issues.

1.7.3.3 Threatened, Endangered, and Candidate Species

Issues associated with threatened, endangered, and candidate species were addressed in the 1997 Draft EIS, Chapter IV, Section IV.F. Approximately 87 to 89 more acres would be disturbed under the partial pit backfill alternatives to build haul roads, cast blast the upper highwall, and install dewatering and monitoring wells and access roads. No new impacts from the disturbance would affect threatened, endangered, or candidate species or their habitats. The agencies concluded no additional evaluation was required.

1.7.3.4 Air Quality

Fugitive dust emissions from mine traffic are expected for partial pit backfill alternatives due to the large amount of backfill anticipated to be transported to the pit. In addition, mine vehicle exhaust emissions are also expected. Potential changes in ambient air quality (Montana and National Ambient Air Quality Standards) and impacts on visibility could occur.

Air quality impacts were evaluated in the 1997 Draft EIS, Chapter IV, Section IV.G. Air quality from hauling waste rock has not been affected beyond the permit boundary during operations. The amount of traffic generating dust and emissions would be similar to historical mine operations. Therefore, the agencies have concluded that no impacts above those analyzed in previous environmental reviews would occur.

1.7.3.5 Aesthetic Resources

1.7.3.5.1 Noise

Noise impacts were evaluated in the 1997 Draft EIS, Chapter IV, Section IV.I. Noise impacts have been minimal beyond the permit boundary during operations. The amount of mine activity generating noise would be similar to mine operations historically. The agencies have concluded that no impacts above those analyzed in previous environmental reviews would occur.

1.7.3.6 Solid and Hazardous Materials and Wastes

Solid and hazardous materials and wastes were addressed in the 1997 Draft EIS, Chapter IV, Section IV.K. No additional materials or waste have been identified that would be generated under the alternatives in addition to impacts disclosed in previous reviews.

1.7.3.7 Cultural Resources

Cultural resource issues were addressed in the 1997 Draft EIS, Chapter IV, Section IV.L. Cultural resources consist of prehistoric and historic archaeological deposits; structures of historic or architectural importance; and traditional ceremonial, ethnographic, and burial sites. Cultural resources are nonrenewable resources, which are afforded protection by federal, state, and local laws, ordinances, and guidelines.

Several previous archaeological surveys have been conducted in the vicinity (Table 1-2). Reports detailing the results of intensive archaeological evaluations conducted in the GSM area are on file at the BLM Butte Field Office and at the SHPO office in Helena. The only cultural resource that might be affected by pit reclamation is a historic cabin near the north highwall. Should an alternative involving cast blasting be selected, there would be an adverse impact to this historic property, which would require mitigation.

1.7.3.8 Paleontological Resources

Paleontological resource issues were addressed in the 1997 Draft EIS, Chapter IV, Section IV.A. No additional impacts to paleontological resources have been identified in the 87 to 89 acres that would be disturbed under the partial pit backfill alternatives in addition to impacts disclosed in previous reviews. The chances of finding a paleontological resource in the pit area geology are minimal.

1.7.3.9 Native American Concerns

Native American concerns were addressed in the 1997 Draft EIS, Chapter IV, Section IV.M. The 87 to 89 acres of disturbance under the partial pit backfill alternatives would not impact any Native American traditional use sites. No new Native American

concerns have been identified in new disturbance areas under the partial pit backfill alternatives. No additional evaluation was required.

1.7.3.10 Areas of Critical Environmental Concern

No areas of critical environmental concern would be affected by any of the alternatives.

1.7.3.11 Prime or Unique Farmlands

No prime or unique farmlands would be affected by any of the alternatives.

1.7.3.12 Floodplains

No floodplains would be affected by any of the alternatives.

1.7.3.13 Wild and Scenic Rivers

No wild or scenic rivers would be affected by any of the alternatives.

1.7.3.14 Wilderness

No wilderness areas would be affected by any of the alternatives.

1.7.3.15 Environmental Justice

As required by Executive Order 12898, Federal *Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* the alternatives were evaluated for issues relating to the social, cultural, and economic well being, and health of minorities and low-income groups. None of these environmental justice issues was identified. The socioeconomic impacts of any of the alternatives would not affect minority or low-income groups disproportionately.

1.7.3.16 Invasive Non-Native Species

Non-native noxious weed species were evaluated in the 1997 Draft EIS, Chapter IV, Section IV.D. The county noxious weed list designates noxious weeds for Montana under the County Weed Control Act 7-22-2101(5), MCA. Seven species on this list were identified in the GSM study area during previous inventories: *Cirsium arvense* (Canada thistle), *Cardaria draba* (whitetop or hoarycress), *Centaurea maculosa* (spotted knapweed), *Euphorbia esula* (leafy spurge), *Linaria dalmatica* (dalmatian toadflax), *Hyocyamus niger* (henbane), and *Cynoglossum officinale* (hounds tongue). In general, these species have been confined to areas of recent and historic disturbance, e.g., roadsides, abandoned roads and homesteads, and drainage bottoms affected by fluvial events and livestock impacts.

Noxious weeds have been actively controlled by GSM since 1984 on areas within the mine permit boundary and on nearby property owned by the mine (GSM 1990 to 2006 Annual Reports). A weed control plan was submitted to the Jefferson County Weed Control Board in 1993. The primary concern has been spotted knapweed because of its widespread occurrence and the potential for infestation in areas of disturbed, dry rocky soils. Dalmatian toadflax has also become a concern. The small areas infested with whitetop are generally limited to ephemeral drainage bottoms and near the Jefferson Slough. Leafy spurge is very limited, also occurring primarily near the Jefferson Slough.

The control of noxious weeds is an important element of successful final reclamation. GSM will continue to monitor and control harmful weeds during operations and closure. The methods of monitoring and controlling invasive non-native species of vegetation would not vary by alternative. The 87 to 89 acres of new disturbance under the partial pit backfill alternatives would increase the area needing weed control. No additional evaluation was required.